CLAIMS

What is claimed is:

1. A network device, comprising:

a data plane for transmitting data between an ingress port and an egress port; and

a control plane in communication with the data plane, the control plane including:

a shared transmit/receive queue infrastructure configured to queue incoming multicast packets to be replicated on a per ingress port basis and to queue transmit packets, and

a multicast processing engine in communication with the shared transmit/receive queue infrastructure, the multicast processing engine including a circular replication buffer to facilitate multithreaded replication of multicast packets on a per egress virtual local area network (VLAN) replication basis.

2. The network device of claim 1, in which the multicast processing engine is configured to request multicast packets from the shared transmit/receive queue infrastructure upon emptying a slot in the circular replication buffer, the requested multicast packet being from an ingress port determined based on a bandwidth management policy implemented by the multicast processing engine, and in which the multicast processing engine empties a slot in the circular replication buffer when all replications for the multicast packet occupying the slot are performed.

3. The network device of claim 1, in which the shared transmit/receive queue infrastructure dynamically allocates memory to the transmit packets and to the incoming multicast packets to be replicated.

4. The network device of claim 1, in which the multicast processing engine includes a scheduler utilizing scheduling algorithms to dynamically adapt the rate at which multicast packets are de-queued for each ingress port as a function of how much output bandwidth each ingress port utilizes.

5. The network device of claim 1, in which the scheduler is configured to request multicast packets from the shared transmit/receive queue infrastructure with a policy to maintain a plurality of threads of replication in the circular replication buffer.

6. The network device of claim 1, in which the control plane further includes a packet parser configured to input queue a multicast packet header in the shared transmit/receive queue infrastructure on a per ingress port basis.

7. The network device of claim 6, in which the packet parser is further configured to de-queue a multicast packet from the shared transmit/receive queue infrastructure, the de-queued multicast packet corresponding to an ingress port as determined by the multicast processing engine.

8. The network device of claim 1, in which the multicast processing engine forwards a replicated multicast packet onto a main control plane pipeline when traffic on the main control plane pipeline allows.

9. The network device of claim 8, in which the control plane further includes a policer module configured to receive replicated multicast packet on the main control plane pipeline from the multicast processing engine, the main control plane pipeline containing at least one of unicast, layer 2 (L2), and multi-protocol label switching (MPLS) traffic.

10. A control plane multicast packet processing engine, comprising:

a circular replication buffer for facilitating multithreaded replication of multicast packets on a per egress virtual local area network (VLAN) replication basis; and

a scheduler in communication with a shared transmit/receive queue infrastructure for queuing incoming multicast packets to be replicated on a per ingress port basis and for queuing transmit packets, the schedule being configured to de-queue multicast packets associated with the ingress ports into the circular replication buffer, the scheduler utilizing scheduling algorithms to dynamically adapt the rate at which the multicast packets are de-queued from each ingress port as a function of how much output bandwidth each ingress port utilizes.

11. The control plane multicast packet processing engine of claim 10, in which the scheduler is configured to request multicast packets from the shared transmit/receive queue infrastructure upon a slot emptying in the circular replication buffer, the requested multicast packet being from an ingress port determined based on a bandwidth management policy implemented by the scheduler, and in which the slot in the circular replication buffer is emptied when all replications for the multicast packet occupying the slot are performed.

12. The control plane multicast packet processing engine of claim 10, in which the scheduler is configured to request multicast packets from the shared transmit/receive queue infrastructure with a policy to maintain a plurality of threads of replication in the circular replication buffer.

13. The control plane multicast packet processing engine of claim 10, in which the multicast processing engine forwards a replicated multicast packet onto a main control plane pipeline when traffic on the main control plane pipeline allows.

14. The control plane multicast packet processing engine of claim 13, in which the main control plane pipeline contains at least one of unicast, layer 2 (L2), and multi-protocol label switching (MPLS) traffic.

15. A computer program package embodied on a computer readable medium, the computer program package including instructions that, when executed by a processor, cause the processor to perform actions comprising:

queuing incoming multicast packets to be replicated on a per ingress port basis in a shared transmit/receive queue infrastructure, the shared transmit/receive queue infrastructure being configured to queue the incoming multicast packets to be replicated and transmit packets;

determining an ingress port from which to de-queue multicast packets;

de-queuing multicast packets from the shared transmit/receive queue infrastructure, the de-queued multicast packets being associated with the determined ingress port and placed into a replication buffer for replication; and

performing multithreaded replication of multicast packets on a per egress virtual local area network (VLAN) replication basis utilizing a replication buffer

16. The computer program package of claim 15, in which the de-queuing is performed upon a slot in the replication buffer being emptied and in which the slot in the replication buffer is emptied when all replications for the multicast packet occupying the slot are performed.

17. The computer program package of claim 15, in which the determining the ingress port from which to de-queue multicast packets is based on a bandwidth management policy.

18. The computer program package of claim 15, in which the de-queuing of the multicast packets from the shared transmit/receive queue infrastructure for each ingress port is at a rate dynamically adapted as a function of how much output bandwidth each ingress port utilizes.

19. The computer program package of claim 15, in which the de-queuing of the multicast packets from the shared transmit/receive queue infrastructure is implemented with a policy to maintain a plurality of threads of replication in the circular replication buffer.

20. The computer program package of claim 15 including instructions that cause the processor to perform actions further comprising:

forwarding replicated multicast packet onto a main control plane pipeline when traffic on the main control plane pipeline allows.